

# Health Risk Screening Analysis

Red Star Yeast and Products  
A Division of Universal Foods Corporation  
Oakland, California  
Facility #A3523

Acetaldehyde Emissions from Fermentation Vessels



BAY AREA  
AIR QUALITY  
MANAGEMENT  
DISTRICT

Toxic Evaluation Section  
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## **1. Background**

The Bay Area Air Quality Management District (BAAQMD) has completed a health risk screening analysis for acetaldehyde emissions from five fermentation vessels that are used for nutritional yeast production at the Universal Foods facility located in Oakland. This report summarizes the methodology and results of the screening analysis.

## **2. Summary of Methodology**

The maximum health risks were estimated using guideline procedures adopted for use in the Air Toxics Hot Spots (ATHS) Program. The general ATHS Program approach involves using air emission estimates and dispersion modeling to estimate maximum ambient air concentrations of toxic air contaminants (TACs), and then using these concentrations to estimate an individual's maximum exposure and health risk based on toxicity values adopted by the Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA). For acetaldehyde, OEHHA has adopted a chronic inhalation Reference Exposure Level (REL) of  $9.0 \mu\text{g}/\text{m}^3$ , and an inhalation cancer unit risk factor (URF) of  $2.7\text{E}-06 (\mu\text{g}/\text{m}^3)^{-1}$ .

### **2.1 Emission Rate**

The risk screening analysis was based on the Year 2000 P/O-approved acetaldehyde emissions. The total emissions for the five fermentation vessels were 32,500 lb/year.

### **2.2 Dispersion Modeling**

Long-term average acetaldehyde air concentrations were generated using EPA's ISCST3 dispersion model. Source inputs were based on stack parameters and building dimensions provided by the facility. Wind direction-specific building dimensions used for addressing aerodynamic downwash influences were generated using U.S. EPA's BPIP Program. Meteorological inputs were generated from sequential on-site surface wind data and upper-air data collected at the Oakland International Airport over the five year period 1979 to 1983 using EPA's PCRAMMET meteorological preprocessor. Receptor inputs consisted of a rectangular grid of receptor points spaced at 30-meter intervals within the modeling domain. Terrain elevations for sources and receptors were extracted from U.S. Geological Survey (USGS) 30-meter Digital Elevation Models.

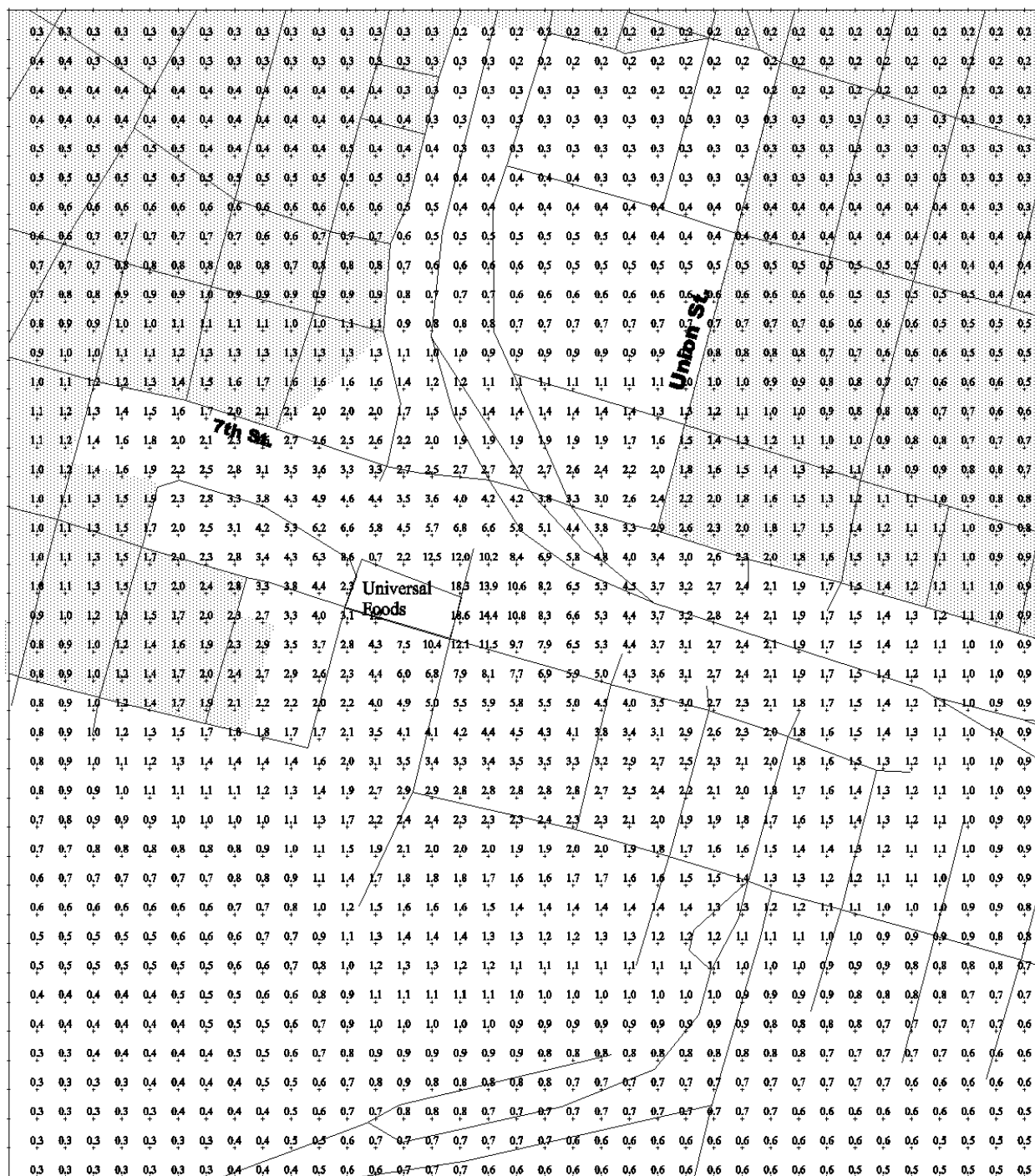
### **2.3 Exposure and Health Risks**

Public exposure to the predicted acetaldehyde air concentrations was evaluated based on an assessment of land-use within the modeling domain. The land-use information used for this purpose was a real property database that was compiled from records on file with the Alameda County Assessor. Exposure in residential areas was assumed to be continuous. Exposure in non-residential areas was assumed to be 8 hours per day, 240 days per year for 46 years. The maximum health risks from the facility's acetaldehyde emissions were calculated based on the maximum predicted exposures and the OEHHA chronic REL and cancer URF.

### **3. Summary of Results**

A summary of the dispersion modeling results is given in Figure 1. A summary of the calculations used to estimate the maximum incremental health risks is given in Table 1. The maximum lifetime cancer risk was estimated to be  $7.8\text{E-}06$  (7.8 in one million). The maximum chronic hazard index was estimated to be 0.46.

**Figure 1. Universal Foods ISCST3 Model Predicted Average Acetaldehyde Air Concentrations (32,500 lb/yr emitted)**



Values posted are 5-year average ground-level concentrations in micrograms per cubic meter

ISCST3 Model was run in Urban-Mode with 1979 - 1983 Oakland Airport Met Data

Residential areas are shaded

Table. 1 Universal Foods Maximum Health Risks

A	B	C	D	E	F	G	H	I
receptor	annual acetaldehyde emissions (lb/yr)	max. average ambient air acetaldehyde concentration (ug/m3)	acetaldehyde cancer unit risk factor (ug/m3)-1	cancer risk exposure adjustment factor	acetaldehyde chronic non-cancer Reference Exposure Level (ug/m3)	non-cancer risk exposure adjustment factor	maximum cancer risk (Cx Dx E)	maximum chronic Hazard Index (C/F x G)
residential	32500	2.9	2.70E-06	1	9	1	7.83E-06	3.22E-01
industrial	32500	18.6	2.70E-06	0.14	9	0.22	7.23E-06	4.55E-01

cancer risk industrial exposure adjustment factor =  $8/24 \text{ hr/day} \times 240/365 \text{ day/yr} \times 46/70 \text{ yr/lifetime}$

non-cancer risk industrial exposure adjustment factor =  $8/24 \text{ hr/day} \times 240/365 \text{ day/yr}$